

Editorial

Increasing Credibility of LCA *

Bo Pedersen Weidema

Institute for Product Development, Building 424, DK-2800 Lyngby, Denmark; e-mail: bow@ipt.dtu.dk

It is important for the future of LCA, as one of the important techniques in environmental management, that LCA results become generally regarded as relevant, reliable, and uncontroversial.

To this end, LCAs must:

- be understood and perceived as a reasonable basis for decisions by the intended audience,
- be implemented into decision making and industrial practice without unnecessary controversy,
- communicate the reliability of their results in terms of uncertainty, based on an assessment of the data quality of the information used,
- be critically reviewed according to the ISO procedures at a high level of excellence.

Targeting LCA for Decision Making

Some applications of LCA are listed in the current standard ISO 14040:

- product development and improvement,
- strategic planning,
- public policy making,
- marketing,
- all applications which have to do with supporting decision making by analysing the consequences of a choice between different alternatives.

Nevertheless, LCA studies often appear without any indication of the consequences of the decision that the LCA is supposed to support. This may lead to serious misinterpretations of the results.

Even when the consequences of the decision is properly analysed and documented, it is still necessary to communicate this to the decision-makers in such a way that the message is understood. Long tables of figures and obscure environmental indicators are not facilitating this. New tools are needed for presenting the information from LCAs in a form readily understandable for the audience. This is equally true for strategic decision-makers, eco-designers and consumers making a choice in a shop. The real challenge is to communicate the LCA results in such a way that the information does not become lost, biased or oversimplified in the process.

Avoiding Controversy

Realising that an LCA is not made in a vacuum, but serves as support for decision making, highlights the importance of involving the decision-makers during the study. It is a waste of resources if the issues addressed by the study are different from those that the decision-makers regard as important. Depending on the situation of the decision-maker, it may be relevant to include other stakeholders that may be affected by or have influence on the consequences of the decision.

* DOI: <http://dx.doi.org/10.1065/lca2000.02.014>

In spite of this, it is often seen that studies do not adequately address the decision-making context and the concerns of the decision-makers. Also, it is common that studies without proper stakeholder involvement result in controversies, which hamper the smooth implementation of the suggested environmental improvements.

Among one of the target audiences, industrial designers, it has been demanded that LCAs should reflect better the relevant future scenarios, including also further societal consequences. This points to several important issues that are often disregarded in currently published LCAs:

- The relevant time horizon and the future scenario, including the dynamic interactions of different developments.
- The market upon which product is traded. The studies are typically limited to one product or a few product alternatives, not reflecting the kind of substitutions that will take place in practice. Or, the studies imply (directly or indirectly) a substitution that cannot occur in practice, because the market demands certain product properties to be fulfilled.
- The scale of a product substitution. Typically, studies apply arbitrary sizes of their functional unit, not taking into account that large-scale changes may affect the boundary conditions of the study, and thus the technologies to be studied.
- Changes in the amount of product consumed and the determining factor for this.
- Changes in social behaviour, i.e. in the way the products are used, as a result of a substitution between product alternatives.
- Price differences between the compared products, so that the effects of the substitution on the overall spending-pattern can be included.
- The consequences of a substitution for the surrounding or complementary product systems.
- The secondary use of a product.
- The market consequences of a change in demand. Typically, the environmental exchanges of the immediately delivering process is included, instead of identifying what process will ultimately be affected (based on the current trend in the market and the process most sensitive to changes in demand).
- System expansions to avoid arbitrary allocations of the environmental exchanges.

Uncertainty and Data Quality

Surprising discrepancies can be found when comparing the issues of largest importance from an environmental point of view with the issues covered by currently published LCAs. There seems to be no proportion between the way LCA deal with a certain issue and the environmental importance of that issue. This is true both with regard to:

- the products studied (e.g. more studies deal with packaging than with the contents of the packaging, more studies

- deal with automobile parts than with redesigning transport systems),
- the life cycle stages (e.g. there is very little focus on the use phase, which determine a large part of the environmental effects of the rest of the chain, more studies go into detail with the food industry than with agriculture, which cause the main impacts related to food products),
- the applications (e.g. the number of studies made for ecolabelling purposes is out of proportion with the environmental importance of this application as opposed to product development and strategic studies),
- the environmental impact categories (e.g. biodiversity and noise, which are important issues in the public perception of the environment, are hardly touched upon by LCA, while trivial issues such as material resource use and BOD/COD-emissions are often described with great precision).

The credibility of LCA as a technique is affected by such examples of misplaced concreteness.

It is obvious that a large part of the reason for the described discrepancies is the availability of funding. Areas with competitive interest and demands from the authorities receive more funding than areas where there are no competitive challenges and no regulation. Another part of the explanation is convenience. Some of the significant areas are simply more difficult to study. However, the readiness of LCA practitioners to accept to study any issue without questioning its environmental importance, may eventually fall back on the way the technique is perceived. If the full transformation potential of the technique is not utilized, the technique may eventually be discredited as uninteresting.

A similar problem occurs when a large data collection effort is directed towards data of minor importance. It is often stated that 80% of the results are obtained with 20% of the effort. The most important part of the work is the correct identification of the object of study and the correct modeling of the product systems. Often, it may be determined which of two alternatives is the environmentally superior without collecting and calculating emission data.

The simplicity and ease of applying LCA as a qualitative technique has lead to an undue academic interest in the problems that occur when the technique is applied in its quantitative form. Thus, LCA is too often presented and perceived as an excessively quantitative technique at the expense of the many results obtained from qualitative studies. This is also the case for the description given in the ISO standards, although they do not explicitly require any quantification.

The focus on the quantitative approach has lead to an unfortunate – and paradoxical – disregard for the importance of uncertainties. More often than not, data are presented as single values without indication of uncertainty or data quality. Combined with a far to scarce use of alternative scenarios, this leads to an inability to distinguish between important and less important. If instead knowledge on uncertainties is applied to create different scenarios and to calculate the uncertainties of these, an iterative process can quickly focus the data collection on the items of largest importance. Although it is often stated – also in the ISO standards – that LCA is an iterative technique requiring the use of sensitivity analysis and consequent refinement of the system boundaries, this does not show very clearly in the published LCA studies.

The inability to distinguish between important and less important not only causes a waste of resources on less important issues. The opposite side of the problem is that too few resources

are directed to the important issues. Sometimes, this apparently leads to the paradoxical situation that irrelevant data are used, just because they were available. Important process data are often not adequately validated, e.g. by mass balances, and cross-checks with similar data, model results, and statistically derived top-down estimates. Important processes and important impact categories are often disregarded with the argument of lack of resources or lack of knowledge – which, however, does not always discourage the practitioner from making a conclusion in which this limitation is seldom repeated!

Critical Review

The above points of criticism of current LCA practice can be remedied, and peer review (critical review according to the ISO procedures) may play an important role in this process. This requires, however, that the critical reviews are performed at a high level of excellence that takes the above criticism serious. To ensure this, there is a need to:

- publish a guide on how to perform peer reviews at a high level of excellence,
- gather peer reviewers, practitioners and commissioners to discuss difficult aspects of the peer reviewing procedure and ways to enhance performance,
- publish examples of good practice.

Critical review will be one of the topics that the SETAC LCA-Steering Committee will focus on in the coming period.

Increasing Credibility of LCA

Several of the above topics will be discussed at the next LCA Case Studies Symposium of SETAC-Europe which has the topic: "Increasing credibility of LCA". Presentations of LCA case studies are invited under three headings:

- Targeting LCA for decision making:* The case studies to be presented under this heading will cover LCAs with focus on the presentation format and the targeting of the audience, as well as participatory LCAs where representatives of the audience are involved during the study, and LCAs with specific or novel procedural aspects with a view to ensure the most relevant decision basis for the intended audience.
- Uncertainty and data quality:* The case studies to be presented under this heading will cover LCAs with an explicit use of data quality management and/or uncertainty on data used, implementations of uncertainty and/or data quality information in LCA databases and softwares, and LCAs which communicate uncertainty of their results explicitly and/or in novel ways, based on a serious analysis of the data quality of the information used.
- Critical review:* The case studies to be presented under this heading will cover peer reviewed LCAs with focus on the role of the critical review in correcting errors and ensuring quality and credibility, critical reviews with focus on difficult aspects of the reviewing procedure and/or introducing new improved ways to perform the reviews, and finally examples of the use of critical review in the communication of LCA results. Examples of both interactive peer reviews and end-of-study reviews are invited.

The Case Studies Symposium is held on the 30th of November 2000 in Brussels, and the deadline for receipt of abstracts is the 28th of April 2000. More information can be obtained from Valérie Verstappen at the SETAC-Europe office (setac@ping.be).

Received: January 28th
Accepted: February 11th, 2000
Online-First: February 14th, 2000